breaks being so generally of long duration, there was no difficulty at arriving at a just conclusion as to the value of cholera camping when this method was introduced as soon as a sufficient number of instances (comparatively small in this case) could be brought forward. So far as the evidence in my possession goes, in most districts in the North-West Provinces the duration of village outbreaks resembles more that quoted for British troops in cantonments than the instance of the Mainpuri district. The following table gives a summary of the data I have collected:

Locality.	Date.	Number of Outbreaks Reported.	Average Duration in Days.
Agra district... ...	1891	4	10¾
,, ...	1892	27	53¾
,, ...	1894	7	41⅛
Allahabad district...	1893	11	36½
,, ,, ...	1894	34	151⅛
,, ,, ...	1895	17	63
Narsingpur district	1891	5	50⅜
,, ,,	1892	18	57⅜
,, ,,	1893	22 (not treated)	81½
,, ,,	1895	53 (treated)	24
Nimar district ...	1895	27 (treated)	17
Bijnor district ...	1895	19 (treated)	15¼

In the last three groups of outbreaks in the above table the wells had been treated with permanganate, but this was carried out by native subordinates; there are grounds for suspecting that it was not done properly, and I therefore do not propose to quote these cases as evidence either for or against the value of the method. I have no doubt that native subordinates can carry out the process carefully, and that they have done so in many instances during the recent famine, but when the process was being introduced, and before its object was understood, it is probable that in many instances the prejudices of the villagers prevented its having a fair trial. Consequently for the purposes of scientific discussion, I propose to quote in the first instance only cases in which the treatment of the wells was carried out by European officials. Down to the end of 1895 I was able to collect 50 such instances. Out of these 50 instances in 11 cases no success was recorded. An analysis of these 11 failures shows that in every case only a portion of the water supply was treated. In 3 out of these 11 cases, evidence was obtained that nearly all of those attacked after treatment of the wells were persons who had only drunk not-treated water. In one case the treated well was closed, thus driving the inhabitants to use water from other sources, which were shown by later research to contain the cholera microbe.

Of the remaining 39 outbreaks, in 3 cases the treatment of the wells was only commenced more than thirty days after the appearance of the cholera, at a time, that is to say, when it is possible that the disease had already run its natural course.

This leaves us with 36 outbreaks, out of which in 16 cases no further attacks were reported after treatment of the wells. Of the remaining 20 outbreaks, in 10 some "later cases" occurred. By this I mean that attacks were reported as having occurred later than three days after the date of treatment of the wells. In the remaining 10 cases, attacks only occurred during the first three days after the use of permanganate, that is to say during the time covered by the probable incubation period of the disease. The above-mentioned "later cases" were few in number, generally occurring on the fourth or fifth day after treatment of the wells. In one village it was noted that of the two later cases, one was that of a man who had refused to allow his well to be treated.

Since collecting the details of the above 50 outbreaks, I have received but few detailed accounts of the results of employing the method, though its use has widely extended. But during my recent visits to Bombay, I met many sanitary and medical authorities from different parts of India, every one of whom who had used the method was convinced of its utility. But the most authoritative statement that I can quote is the following extract from a report by Mr. Palmer, Superintending Engineer, Allahabad Circle, published in the official report on the recent famine in the North-West Provinces:[1]

The experience of the present famine and latter part of the preceding one affords the highest presumptive evidence of the value of permanganate of potassium as a disinfectant in cholera. During April, 1896, we were attacked by cholera, and could not in any way get rid of it except by marching the people from place to place till it died out. We felt all the time that we were not combating it, but simply running away till it was tired out. Under this difficulty I consulted Professor Hankin, of Agra, on the subject, and he immediately furnished me with instructions on the use of permanganate of potassium, which were issued to all on April 18th, 1896; but the permanganate did not come to hand till May. In the succeeding epidemic of May, 1896, the permanganate was used somewhat perfunctorily and without any understanding of its importance, or much belief in its efficacy, on the part of the officers in charge and the visiting inspectors; its use, however, extended. The disinfection of wells is strongly insisted on in the Public Works Department rules issued in December, 1896, and enforced general attention to the point. The first March epidemic in Allahabad was earlier than expected, and caught us in the midst of a struggle with other difficulties, and without a large enough supply of the drug at hand. A supply of 1,700 lbs. of permanganate was at once ordered (ready made up in 5-lb. boxes of 2-ounce packets) and obtained with difficulty: meanwhile the epidemic raged in just the same ungovernable way as last year. In April we got the drug well distributed at all points, and the disinfection of wells going on everywhere, apparently contaminated or not. After this there was no more mere blind running away from cholera, but we were able to fight it, and we did so with early success in every case excepting the attack in Hamirpur. All officers on the relief works got to thoroughly believe in the efficacy of the drug, and much attention was given to its use. Many zamindars asked for packets of it for use in wells which were not near our works, and many others asked us to disinfect their wells for them. Under the name of "lal dawai" this drug is now familiar in every hamlet of the Bundelkhand districts and is largely believed in. It has been often shown by Professor Hankin how impossible it is to ensure disinfection in many cases; but there is no reasonable doubt that in permanganate of potassium we have a most valuable ally in combating these baneful choleraic epidemics. Altogether we have used up about 1,950 lbs. of the drug; and the small practical point of having it ready made up in 2-ounce packets, 40 packets in a tin box, was found to be of the greatest assistance in facilitating its use. The simple directions now are to go on putting in half a packet at a time till the water retains a faint pink colour for four hours, and to repeat the dose every week, preferably on a Sunday.

Further on in the report on the famine it is stated that permanganate "undoubtedly proved a most useful agent in checking disease." Considering that this evidence is drawn from observations carried out on a population whose power of resisting cholera was probably greatly lessened by the existence of famine, it will be admitted that it is of great value in leading to a conclusion as to the value of permanganate. But it must be borne in mind that its use was only one of the many important administrative measures employed with conspicuous success during the famine to protect the people from disease.

I may conclude this paper with the following extract from the preface of a pamphlet that I published in 1895 with the aim of popularising the method:

It may be well to mention here, as I have done elsewhere, that the method of purifying water by means of permanganate, to which I have been standing as godfather, is by no means new. Permanganate was used in drinking water during the London cholera epidemic of 1866. Its use has been advocated by many sanitary authorities before and since, such as Parkes and Surgeon-Colonel King, the present Sanitary Commissioner of Madras. I am under the impression that it was used more especially with the object of freeing water from organic matter, and that when it was proved that cholera was not due to organic matter as such, but to a specific microbe, the use of permanganate to a great extent went out of fashion, until attention was again drawn to the subject by a paper that I published in November, 1894, in the *Indian Medical Gazette*, and in a paper read in the following month before the Indian Medical Congress.

The method is of interest from the scientific standpoint, as its success appears to give the last proof of the truth of the view, for long so ably advocated by the late Mr. Ernest Hart, that cholera is in most cases a waterborne disease.

REFERENCES.

1 Narratives and Results of the Measures adopted for the Relief of Famine during the years 1896 and 1897, published in the *North-West Provinces and Oudh Government Gazette* of November 27th, 1897, page 454.

NOTE ON THE DRAINAGE OF LARGE CAVITIES AFTER SURGICAL OPERATIONS.*

BY GEORGE HEATON, M.B.OXON., F.R.C.S.,
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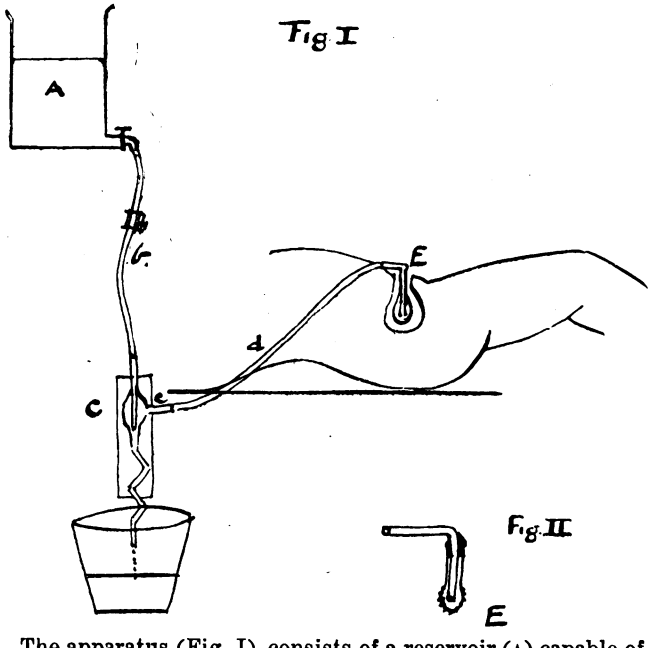
WHEN a hollow organ such as the urinary or gall bladder has been opened, or when a large suppurating cavity has to be drained, the surgeon after his operation often has much difficulty in keeping the patient and his dressings dry and clean.

* Read at a meeting of the Pathological and Clinical Section of the Midland Counties Branch of the British Medical Association.

If it be some intraperitoneal structure, such as a suppurating gall bladder, liver abscess, or suppurating pelvic cyst which has been opened and then stitched to the parietal peritoneum, some efficient method of drainage during the first few days becomes of even vital importance. The leakage of pus or other irritating fluid in the first few hours after the operation, before the cavity of the peritoneum has been shut off by plastic inflammation, has frequently been the cause of a spreading fatal peritonitis. But even when—as in the case of a suprapubic opening into the urinary bladder—a hollow organ has been opened without involving the peritoneum, if the discharge be at all profuse, there will be considerable difficulty in keeping the dressings dry. It is only by an almost constant changing of dressings and the use of large quantities of absorbent materials for collecting the escaping urine that the patient can be kept at all dry and clean; and, despite every care in nursing, the bed is apt to get wet and the patient chilled.

During the past twelve months I have tried several modes of drainage with a view of obviating this, and have at length found one which I believe to be both simple, efficient, and inexpensive. I lay no claim to originality in the principle of the apparatus. The idea, indeed, was suggested by seeing the siphon arrangement used by dentists for the mouth during their operations. Several such siphon drains have also been described by surgeons.

The principle of the apparatus is the keeping up of a continuous slight siphon action from the cavity to be drained by means of a modified Sprengel's pump. Only sufficient suction is required to keep up a siphon action; indeed, any powerful suction is apt to be injurious to the tissues of the patient.



The apparatus (Fig. I) consists of a reservoir (A) capable of holding about two gallons, which is connected by means of the tube (*b*) with the upper limb of a glass Sprengel pump (C), which is usually fixed to one of the legs of the patient's bedstead.

The side tube (*c*) of the pump is connected by means of a second piece of drainage tubing (*d*) with a perforated glass bulb (E) (Figs. I and II), which is placed in the cavity to be drained.

When water is allowed to trickle very slowly from the reservoir (A) through the pump (C) into a pan placed below to receive it, sufficient siphon action is maintained in the side tube (*d*) to remove even the smallest quantity of fluid as it collects in the cavity to be drained, and this passes down with the water from the reservoir into the vessel beneath the bedstead, leaving the patient and his bed quite dry.

The chief difficulty experienced was in securing a satisfactory glass ending to be placed in the cavity. When an ordinary piece of glass tubing was used, or one perforated at the sides (like a Keith's drainage tube) the wall of the cavity to be drained was soon sucked into the open end and lateral openings, giving the patient pain and putting an end to all siphon action.

This difficulty is overcome by having two tubes, an outer one perforated at the sides, which encloses an inner one which is connected with the pump. Fluid as fast as it collects in the cavity trickles through the perforations of the outer tube, and is then sucked up by the open end of the inner tube. Several such glass endings have been tried, varying in size and shape with the wound and cavity to be dressed.

During the past six months I have used this apparatus on six patients after operation.

Two cases of suprapubic drainage of the bladder after removal of villous papillomata.

One case of cholecystotomy.

Two cases of suprapubic cystotomy for intractable cystitis.

One case of suprapubic lithotomy.

The apparatus has answered its purpose well in all. The only case which calls for any comment is one in which I am using it at present in the General Hospital, and which gives a good idea of its efficiency and usefulness.

It is the case of an old Crimean soldier, who was admitted into hospital in July last. He has a fracture of the dorsal spine high up, with typical symptoms of complete severance of the spinal cord at the seat of fracture.

Regular passage of a catheter for the relief of his retention of urine soon set up a cystitis, and at the same time acute bedsores made their appearance on the buttocks and sacrum. Unless a catheter was passed at almost hourly intervals urine dribbles away, wetting his bed and irritating his bedsores.

On July 26th, 1897, with the assistance of Mr. Chavasse, I performed a suprapubic cystotomy. No anæsthetic was needed, as the patient's tissues were completely insensitive. A glass tube was put in the suprapubic wound and connected with the apparatus, and he has worn it ever since—a period of 5 months. The apparatus has during all this time kept him and his bed dry and clean. The bedsores relieved of the irritating urine rapidly healed, and the patient's condition at the present time is almost as good as when he was admitted, though unfortunately a fresh bedsore has recently formed.

The reservoir requires filling twice in twenty-four hours, and once each day the glass ending is removed from the patient's bladder in order to cleanse it from the phosphatic deposit which collects in it. Beyond this his bladder requires no attention whatever.

The apparatus, which without the reservoir (for which an ordinary washhand-jug will suffice) costs some five or six shillings, has been made for me by Messrs. Philip Harris and Co., to whom my thanks are due for the care they have shown in carrying out my instructions.

A CASE OF ANTRO-TYMPANIC DISEASE AND BEZOLD'S MASTOID ABSCESS COMPLICATED WITH EXTRADURAL ABSCESS:

PARALYSES ON THE SAME SIDE AS THE LESION SUPERVENING AFTER OPERATION: RECOVERY.

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THE patient, a largely-developed girl, aged 15 years, was first seen by me on October 22nd, 1895. Her mother gave the history of a discharge of "matter" from the left ear for twelve years, of pain in the head, intense at times, for six months, and of a gradually increasing swelling in the left upper part of the neck for two months. There was no history of vomiting, dizziness, or paralysis. The girl was acutely ill, and staggered a little in her walk. The temperature was 103° F., and the pulse 110. A fluctuating, and in places red and œdematous, swelling extended from the vertex in the parietal region, and occupied the anterior and posterior triangles of the left side of the neck to the level of the thyroid cartilages. The head was held stiffly inclined to the left shoulder.

OPERATION.

On October 23rd, 1895, under chloroform, a semilunar incision was made behind the attachments of the pinna, giving exit to fully 12 ounces of offensive pus mixed with dark blood-stained *débris*. The squamo-temporal and parietal bones were found denuded, the external surface of the mastoid process rough, and its tip carious and eroded. The abscess cavity extended deeply into the neck under the sterno-mastoid muscle. After removal of some superficial